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Feeding Potatoes to Livestock

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Preface

Potatoes are available in varying amounts for feeding livestock, depending on the growing season and the market price. When the price is low, large quantities may be marketed profitably through livestock. Culls are always available for this use.

This bulletin presents pertinent information helpful for the efficient feeding of potatoes to five classes of livestock:

	Page
Dairy Cattle	4
Beef Cattle	5
Sheep	7
Swine	9
Horses	11

Feeding Potatoes to Livestock

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POTATOES are a succulent type of feed containing about 20 per cent dry matter, the major portion of which is made up of starch or carbohydrates. They are very similar in composition to corn silage and contain approximately twice as much digestible nutrients as wet beet pulp or beet tops but only one third the nutrients of alfalfa hay (*Table 1*). Potatoes are definitely deficient in protein, minerals, and vitamins and therefore should be fed only as a part of a well-balanced ration.

The feeding of potatoes in too large amounts or in unbalanced rations usually results in poor gains, weak offspring, and a reduced milk flow.

Table 1. Average composition and digestible nutrients per 100 lb.*

	Dry matter per cent	Dig. protein per cent	Total dig. nutrients per cent	Ca per cent	P per cent	Nutritive ratio
Potatoes	21.2	1.1	17.3	0.01	0.05	1 : 14.7
Corn silage, well matured	28.3	1.3	18.7	0.07	0.06	1 : 13.4
Beet pulp, wet	11.6	0.8	8.9	0.09	0.01	1 : 10.1
Beet tops	11.6	1.4	7.7	0.15	0.04	1 : 4.5
Alfalfa, all analyses	90.4	10.6	50.3	1.43	0.21	1 : 3.7

* Morrison, F. B. 1936. *Feeds and Feeding.* Ed. 20, The Morrison Publishing Co., Ithaca, New York.

Potatoes should be stored and fed so they will not freeze, rot, or sprout, for in any one of these conditions they are toxic as a feed for stock. Freezing and thawing cause the sugars and starches in the potatoes to break down, and fermentation starts, making them generally unsafe for feeding. When potatoes sprout, a poisonous substance, solanin, is produced, which makes them dangerous as a livestock feed. The sprouts should be removed before feeding.

Potatoes should be introduced gradually into the rations of all livestock, because raw potatoes tend to upset the digestive system if fed in too large amounts before the body is accustomed. Potatoes increase the flow of digestive juices in the stomach and intestines.

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Dairy Cattle

Sound, raw potatoes make a satisfactory feed for dairy cows when fed in limited quantities.

Method and Amount

Potatoes should be cut or chopped and fed to cows individually, preferably in stanchions. If potatoes are fed in the open to a group of cows, the timid cows may not get their share, and frequently a "boss" cow will hook another and cause her to attempt to swallow a large potato which lodges in the throat. Potatoes should be fed in small amounts at first and the amount gradually increased up to 15 to 20 pounds daily in two or more feeds for the smaller breeds such as Jersey and Guernsey; 20 to 25 pounds daily for the larger breeds such as Holsteins. Some cows are susceptible to scours and bloat caused by potatoes, so care should be used to determine the proper amount that each cow can consume without bloating or scouring. Raw potatoes should be fed to dairy cows, since more digestive troubles occur with cooked potatoes, and more time and expense are required to cook them.

Choking may be prevented by chopping or cutting potatoes before feeding to cows. Only sound potatoes should be fed. All decayed or frozen potatoes, and "green" potatoes, should be sorted out before feeding. Sprouts should also be removed before feeding, as the sprouts and green tubers contain slight quantities of solanin, which is poisonous. Feeding should be started in small quantities and the amount gradually increased. Potatoes have a laxative effect, so should not be fed with other feeds such as molasses, which have a similar effect. Each cow should be watched carefully, and if the manure becomes too thin, or bloat appears, the amount of potatoes should be reduced. Potatoes should be fed to cows as individuals, so as to control the quantity eaten by each cow, as some cows bloat or scour on smaller quantities than others.

Feed Value

Potatoes are a low-protein, succulent roughage, quite similar in chemical composition to corn silage, and fulfill much the same purpose in the ration of dairy cows. Potatoes may be substituted for corn silage with satisfactory results.

When potatoes and alfalfa hay are fed to dairy cows, part of the alfalfa is replaced by the potatoes. Potatoes are worth about one-third the price of alfalfa hay, based on the total digestible nutrients. In other words, the price in cents per bushel of potatoes should be the same as the price in dollars per ton of alfalfa. If alfalfa is worth $10 per ton, potatoes are worth 10 cents per bushel as a dairy feed.

Best results will be secured when potatoes are fed with a legume roughage such as alfalfa, as the high-protein alfalfa tends to balance the low-protein potatoes. If both silage and potatoes are to

be fed, the total amount of the two combined should not exceed 3 pounds per 100 pounds body weight daily.

Since potatoes are low in phosphorus, it is desirable to add 2 per cent steamed bone flour to the grain mixture and also to allow the cows free access to this mineral when potatoes are fed.

Experimental Studies

Feeding trials conducted by the Idaho Agricultural Experiment Station show that the quantities of raw potatoes and silage consumed were very similar, but more hay was consumed when potatoes were fed than when silage was fed. Milk and fat production were approximately the same on the two rations. The results indicated that potatoes are at least 90 per cent as efficient as corn silage for milk production and may serve as a satisfactory substitute.

Feeding of cooked and raw potatoes gave practically the same results; however, some digestive disturbances occurred in the group of cows which received cooked potatoes. After the cows became accustomed to raw potatoes, they ate them readily.

Large cows can be fed 20 to 25 pounds of potatoes daily, and smaller cows 15 to 20 pounds, with safety, if care is used in getting the cows accustomed to eating them.

Potatoes fed in the amounts recommended did not produce off-flavors in the milk when fed to cows. Butter from potato-fed cows was excellent in body and texture, with no tendency toward salviness. Occasionally there occurs a flavor in milk and cream suggestive of potatoes. Several agricultural experiment stations have reported that an organism may cause this flavor defect. In these cases, feeding of potatoes was in no way associated with the potato-like flavor of the milk and cream.

Beef Cattle

Method and Amount

Raw potatoes are considered a very palatable feed for beef cattle and are utilized principally in fattening rations. However, potatoes may be used as a part of the wintering ration for cattle, replacing about one-third the nutrients of alfalfa hay. Potatoes should not be fed as the sole diet for wintering stock. At least two-thirds of the wintering ration should be made up of alfalfa hay. Potatoes may replace part of the dry matter in fattening rations, if they are fed along with good quality alfalfa hay and grain.

Potatoes may be fed whole, but occasionally a steer or cow may be choked; it is, therefore, preferable to chop potatoes coarsely with a spade or power chopper. At the start potatoes should be fed in small amounts, 3 to 4 pounds per steer daily, and gradually increased to a maximum of 20 pounds per steer. The amount fed will vary with the size and feeding capacity of the steers. Calves and light yearlings should be fed a maximum of about 5 to 10 pounds daily. If potatoes are fed in excessive amounts, scouring will usually occur.

Frozen or decayed potatoes should not be fed. Green or sprouted potatoes contain small amounts of solanin which is a poisonous compound and is detrimental to livestock.

Rations

Beef cattle may be fattened satisfactorily by feeding the following ration daily per 1000 pounds of live weight:

Barley	8-10 lb.
Alfalfa hay	15-20 lb.
Potatoes	15-20 lb.

Other grains or combinations of grain or grain by-products may be substituted for barley.

Potatoes may be used in wintering beef cattle by feeding daily as follows:

Alfalfa hay	15 lb.
Potatoes	15-20 lb.

Feed Value

Since potatoes are a succulent feed, they usually have been compared to corn silage to determine their relative feeding value. Research at the Idaho Agricultural Experiment Station has shown that potatoes are equal in feeding value to corn silage (*Table 2*). Expressed in other terms, potatoes contain about one-third the nutrients of alfalfa hay. Potatoes should be worth 20 to 30 cents per 100 pounds or $4 to $6 per ton when fed in limited amounts with alfalfa hay and barley to beef cattle.

Experimental Studies—Potatoes vs. Corn Silage

In 1928-29 long yearling steers were fed potatoes in combination with alfalfa and barley (*Table 2*). The potatoes used were sound, somewhat misshapen, and would grade mostly No. 2. They were fed raw, coarsely chopped with a spade. The amount fed ranged from 15 to 20 pounds per head daily. When fed in larger amounts, there were some digestive disorders, resulting in scouring.

When added to long alfalfa and ground barley, each ton of potatoes replaced 906 pounds of alfalfa and 186 pounds of barley. With alfalfa at $8 per ton and ground barley at $1 per hundred, each ton of potatoes had a feed replacement value of $5.48. When silage was substituted for the potatoes, each ton of silage replaced 886 pounds of alfalfa and 122 pounds of barley, having a feed replacement value of $4.76 per ton. The addition of silage increased the gains 14.6 per cent, while the addition of potatoes increased the gain 20.3 per cent.

Table 2. Comparative value of potatoes and corn silage fed with alfalfa and barley

1 Trial—1928-29
Animal Husbandry Department, University of Idaho
Caldwell Branch Station

	Long alfalfa Ground barley	Long alfalfa Ground barley Potatoes	Long alfalfa Ground barley Corn silage
Number of steers	10	10	10
Days fed	159	159	159
Initial wt. per steer, lb.	876	882	867
Final wt. per steer, lb.	1129	1186	1156
Gain per steer, lb.	253	304	289
Average daily gain, lb.	1.59	1.91	1.82
Average daily ration:			
Long alfalfa, lb.	21.30	18.10	16.20
Ground barley, lb.	7.77	7.77	7.77
Cull potatoes, lb.	.....	16.90	.....
Corn silage, lb.	.....	.....	18.5
Feed for 100 lb. gain:			
Long alfalfa, lb.	1345	945	894
Ground barley, lb.	489	407	427
Cull potatoes, lb.	.....	883	.....
Corn silage, lb.	.....	.....	1018
Per cent waste hay	12.5	18.1	16.8
Market weight, lb.	1074	1138	1098
Shrink to mkt., per cent	4.9	4.1	5.0
Dressing percentage	61.1	60.9	62.0
Carcass grading:			
Choice	1	2	1
Good	9	8	8
Medium	.....	.....	1

When fed in limited amounts the potatoes increased gains and, apparently, the finish of the cattle, though the dressing percentage and carcass grades were not changed materially in the different lots. Fed in limited amounts, potatoes have a feed value fully equal to corn silage for fattening beef cattle.

Sheep

Method and Amount

Cull potatoes are well adapted for use as a part of the ration for both fattening lambs and wintering ewes, if properly supplemented. For fattening lambs, potatoes must always be fed with good quality legume hay (alfalfa) and grain. Lambs may be fed from 1 to 2 pounds of raw potatoes daily. Two pounds of potatoes per lamb daily is considered a full feed for fattening lambs. Start feeding the potatoes in small amounts and gradually increase until the sheep are on full feed. Potatoes may be fed whole or chopped. Many feeders have good success in feeding whole potatoes to sheep.

Cooking potatoes for sheep is of no advantage but actually decreases the feeding value.

Pregnant ewes may be wintered satisfactorily on a partial feed of potatoes. Two to 2½ pounds of potatoes in combination with alfalfa hay should be considered the maximum feed up to lambing time. If larger amounts of potatoes are fed before lambing it may result in weak lambs because of the lack of sufficient calcium, phosphorus, and other food elements due to large intakes of principally carbohydrate feed.

After lambing the potatoes may be increased to 4 pounds per ewe daily without detrimental results. It is always well to keep in mind that when potatoes are fed, good quality alfalfa must make up the bulk of the ration in order to supply the protein, minerals, and vitamins necessary for reproduction and milk production.

Do not feed frozen, sprouted, green, or decayed potatoes to sheep. During extremely cold weather, all refused potatoes should be removed from the troughs within a short time after feeding to prevent the lambs from eating frozen potatoes. In some cases it may even be advisable to discontinue feeding potatoes until the weather moderates.

Rations

A satisfactory ration for fattening lambs through the use of potatoes is as follows:

Barley	1.0 lb.
Alfalfa	2.0-2.5 lb.
Potatoes	1.0-2.0 lb.

Potatoes may be used in a wintering ration for ewes as follows:

Before lambing		*After lambing*	
Alfalfa	4.0-6.0 lb.	Alfalfa	3.0-4.0 lb.
Potatoes	2.0 or less lb.	Potatoes	2.0-4.0 lb.
		Grain	.5-1.0 lb.

Feed Value

Cull potatoes are well adapted for use as a part of the rations for both fattening lambs and wintering ewes. Potatoes are worth 18 to 25 cents per 100 pounds for fattening lambs and have about the same value for wintering ewe lambs when fed with alfalfa hay. Cull potatoes are equal in feed value to corn silage for fattening lambs and have been found to be more valuable as a succulent feed than carrots or cull apples.

Experimental Studies with Cull Potatoes

Fed in light amounts, one ton of potatoes replaced 562 pounds of alfalfa and 240 pounds of barley (*Table 3*). The lambs in this lot were all thrifty and well finished.

The lambs on the heavy ration of potatoes were allowed all the potatoes they would eat, and they consumed less than had been anticipated. On a full ration of hay and grain, with unlimited potatoes allowed, the amount consumed was only 1.63 pounds of potatoes per day. Fed in this way each ton of potatoes replaced 410 pounds of alfalfa and 156 pounds of barley. This lot of lambs was the most uniform of the four used in that year's trials.

Table 3. The value of cull potatoes added to a ration of barley and alfalfa
Animal Hunsbandry Department, University of Idaho
Aberdeen Branch Station

	1 Trial—1928-29				1 Trial—1931-32	
	Alfalfa Barley	Alfalfa Barley Light potatoes	Alfalfa Barley Heavy potatoes	Alfalfa Barley Cooked potatoes	Alfalfa Barley	Alfalfa Barley Potatoes
Number of lambs	123	124	122	122	125	124
Number of days	80	80	80	80	100	100
Initial weight per lamb, lb.	74	74	74	74	67	67
Final weight per lamb, lb.	100	101	103	101	92	92
Av. daily gain, lb.	.32	.34	.36	.34	.25	.26
Av. daily ration:						
Alfalfa, lb.	2.71	2.65	2.59	2.52	2.17	2.26
Barley, lb.	1.12	1.10	1.09	1.09	1.06	.89
Potatoes, lb.	.....	.92	1.63	.94	.....	.90
Feed for 100 lb. gain:						
Alfalfa, lb.	847	772	750	785	858	877
Barley, lb.	352	320	315	342	426	345
Potatoes, lb.	.....	267	473	294	.....	350
Per cent waste hay	25.05	24.78	25.90	29.82	22.70	19.60
Shrink to market, per cent	3.51	6.58	7.46	7.40	5.07	4.62
Market weight, lb.	96.46	96.13	97.46	94.55	90 04	90.00

Cooking the potatoes did not prove profitable. In addition to the expense involved in cooking, the feeding value of the cooked potatoes was less than when the potatoes were fed raw. Each ton of cooked potatoes replaced 422 pounds of hay and 68 pounds of barley.

In the winter of 1931-32, potatoes were checked on their grain replacement value. In this trial more hay was consumed by the lambs receiving potatoes than by those on any other ration. Each ton of potatoes saved 463 pounds of barley, but 109 pounds more of alfalfa was required with each ton of potatoes.

The raw potatoes were sliced with a spade in a cutting box. The potatoes were fed in the grain trough during the middle of the day in place of the mid-day feed of hay.

Swine

Method and Amount

Potatoes may be very satisfactorily substituted for part of the grain in a hog ration. Since potatoes are low in protein, minerals, and vitamins, it is necessary that a well-balanced grain mixture be

fed with them. This can be accomplished by giving the hogs a protein supplement such as tankage, skim milk, buttermilk, or peas. The ration should also include alfalfa hay or green pasture and mineral mixture of 2 parts of ground oyster shell and 1 part of salt. The ground oyster shell can be included as 1.5 per cent of the grain mixture instead of mixing it with salt. When grain rations are balanced with skim milk, buttermilk, tankage, meat scraps, or fish meal as the chief supplement, a calcium supplement such as ground oyster shell is not needed.

It pays to cook potatoes for hogs. Cooking increases the digestibility and improves the palatability. Raw potatoes are worth only one-half to two-thirds as much as cooked potatoes. Cooking can be handily done by steaming the potatoes in a large kettle and adding a small amount of salt. The water in which potatoes have been cooked should be discarded, as it is not palatable. The grain should not be cooked but mixed with the potatoes after they are cooked.

For best results the cooked potatoes should not replace more than one-half the grain ordinarily fed in the ration. Potatoes should be fed at the rate of 2 to 4 pounds per pound of grain and the proportion should not be greater than 4 pounds of potatoes to 1 pound of concentrate.

Rations

Usually potatoes are available at a time when hogs have to be fattened in the fall under dry lot feeding conditions. This condition requires a grain mixture that is balanced with a protein supplement and alfalfa hay. Balanced mixtures to feed with varying amounts of potatoes are listed below:

When 2 pounds of potatoes are fed per pound of grain, feed:

Ration 1

Barley	85 lb.
Tankage	10 lb.
Alfalfa, ground	5 lb.
	100 lb.

When 3 pounds of potatoes are fed per pound of grain, feed:

Ration 2

Barley	83 lb.
Tankage	12 lb.
Alfalfa, ground	5 lb.
	100 lb.

When 4 pounds of potatoes are fed per pound of grain, feed:

Ration 3

Barley	80 lb.
Tankage	15 lb.
Alfalfa	5 lb.
	100 lb.

Mineral supplement: If peas are substituted for tankage, feed 1.5 per cent ground oyster shell or limestone in the ration or give free access to 2 parts of ground oyster shell and 1 part of salt.

In the above rations corn or wheat or a mixture of one or more of the small grains may be substituted for barley. If preferred, skim milk or buttermilk may be substituted very satisfactorily for

tankage by using 15 pounds in place of each pound of tankage or by feeding 2 pounds of skim milk for each pound of concentrate. In case ground alfalfa is not available, fine-stemmed, leafy alfalfa hay may be fed in a suitable rack. For fattening hogs 5 per cent of alfalfa is adequate, but for brood sows and growing breeding stock 10 to 25 per cent of ground alfalfa may be included in the ration with excellent results, depending on the condition of the sows. It is the best and safest swine management to mix the alfalfa in the grain ration, for many times hogs on full feed will not eat enough hay from racks.

Feed Value

About 425 pounds of cooked potatoes are required to replace 100 pounds of grain when not more than 3 or 4 pounds of cooked potatoes are fed with each pound of grain. If 2 pounds of cooked potatoes are fed with each pound of grain, 350 pounds of potatoes will have the value of 100 pounds of grain. In other words cooked potatoes are usually worth about one-fourth the price of grain, when fed in the amounts indicated.

Horses

Potatoes may be used as a substitute for part of the grain ration for horses, or if the horses are receiving no grain, potatoes may replace part of the hay. Potatoes should be fed with caution to horses. In small quantities of 3 to 5 pounds daily, potatoes have a beneficial effect on the general appearance and condition of horses. Horses at work may be fed 12 pounds of potatoes provided the roughage part of the ration is made up principally of good quality alfalfa hay. The hay should be fed at the rate of 1.5 to 2 pounds per 100 pounds of live weight, depending on the quantity of potatoes fed. A daily feed of raw potatoes should not exceed 15 pounds for horses, or about one-fourth of the dry matter. It is not necessary to cook the potatoes.

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